



**MISSOURI DEPARTMENT OF TRANSPORTATION
MATERIALS ENGINEERING
Jefferson City, Missouri**

**Test Method
MoDOT T58
DETERMINATION OF PHOSPHORIC ACID (P₂ O₅)
IN COMMERCIAL FERTILIZERS**

1.0 Scope. This method describes a procedure for determining the percent phosphoric acid in commercial fertilizers by colorimetry.

2.0 Reagents and Apparatus.

2.1 An Atomic Absorption Spectrophotometer or a suitable colorimeter.

2.2 Nitric Acid (HNO₃), 1.42 specific gravity.

2.3 Hydrochloric Acid (HCl), 1.19 specific gravity.

2.4 Potassium Phosphate, Monobasic (KH₂PO₄), Primary Standard Grade, dried at 105-110C for several hours prior to use.

2.5 Ammonium Molybdate ((NH₄)₆MO₇O₂₄•4H₂O), Reagent Grade.

2.6 p-Methylaminophenol Sulfate, Reagent Grade.

2.7 Sodium Acid Sulfite (NaHSO₃), Reagent Grade.

2.8 Cuvets, optical glass, matched, 10mm path length. (Note: If available, an optical glass, automatic flow-through cuvet may be used.)

3.0 Preparation of Standard Solutions.

3.1 Phosphate Stock Solution: Weigh 0.4394 g of dried, primary standard KH₂PO₄ into a 500-mL volumetric flask. Add 30 mL of HNO₃ and 5 mL of HCl and boil until brown fumes have been expelled. Dilute to volume with distilled water.

3.2 5 ppm Working Standard: Pipette a 5-mL aliquot of the phosphate stock solution into a 200-mL volumetric flask and dilute to volume with distilled water. This solution is equivalent to 57.2% phosphoric acid.



3.3 4 ppm Working Standard: Pipette a 4-mL aliquot of the phosphate stock solution into a 200-mL volumetric flask and dilute to volume with distilled water. This solution is equivalent to 45.8% phosphoric acid.

3.4 Blank Working Solution: Boil a mixture consisting of 5 mL of HCl and 30 mL of HNO₃ until brown fumes have been expelled, transfer to a 500-mL volumetric flask and dilute to volume with distilled water. Transfer a 4-mL aliquot to a 200-mL volumetric flask and dilute to volume with distilled water.

4.0 Preparation of Color Development Reagents.

4.1 Acid Molybdate Solution: Pour, with stirring, a solution containing 16.62 g of ammonium molybdate in 156.9 mL of distilled water into a solution of 318.4 mL of HCl to which 29.6 mL of distilled water has been added.

4.2 Reducing Solution: Dissolve 1.0 g of p-methylaminophenol sulfate and 3.0 g of sodium acid sulfite in 100 mL distilled water.

5.0 Procedure.

5.1 Weigh, to the nearest 0.1 mg, 0.50 ± 0.02 g of sample into a 500-mL volumetric flask, adding 30 mL of HNO₃ and 5 mL of HCl. Boil until brown fumes have been expelled, cool to room temperature and dilute to volume with distilled water. Transfer a 2-mL aliquot to a 100-mL volumetric flask and dilute to volume with distilled water. From this second dilution, transfer a 10-mL aliquot to a 20-mL scintillation vial and add a 2-mL aliquot of acid molybdate solution and a 2-mL aliquot of reducing solution. Allow to stand 1 hour for color development. At the same time that the sample vial is prepared, a blank vial, a 4 ppm phosphorus vial and a 5 ppm phosphorus vial must also be prepared and allowed to develop color along with the sample. The blank, 4 ppm phosphorus and 5 ppm phosphorus are prepared by the same procedure used for preparation of the sample, using 10-mL aliquots of the blank working solution, the 4 ppm phosphorus working standard and the 5 ppm phosphorus working standard. (Note: When making determinations on fertilizers with low percentages of phosphoric acid, it is necessary to adjust the sample weight so that the sample working dilution contains between 4 ppm and 5 ppm phosphorus.)

5.2 Calibrate the instrument using the blank solution, the 4 ppm phosphorus solution and the 5 ppm phosphorus solution, then determine the concentration of the sample solution. (Note: When using an Atomic Absorption Spectrophotometer for color measurements, the cuvet holder is placed over the burner in the light path and a Cu hollow cathode lamp is used with the instrument grating set at a wavelength of 640 nm.)

6.0 Calculations.

6.1 The method of calculating the % phosphoric acid will vary according to the make and model of instrument used.



Report the results to the nearest 0.1% P_2O_5 as follows:

% Phosphoric Acid (P_2O_5)

